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NPIC/TSSG/RED-103-70

31 MAR 1970

MEMORANDUM FOR: Director, National Photographic Interpretation Center

SUBJECT : Request for Approval of a Contract for the Design and Fabrication of an Experimental Device for the Calibration of the High Precision Stereo Comparator for [] from FY-1970 R&D Funds

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1. This memorandum requests approval for the commitment of R&D funds for a contract. The specific request is stated in Paragraph 8.

2. The High Precision Stereo Comparator (HPSC) presently under development is scheduled to be in operation at NPIC by the end of 1970. This sophisticated comparator provides stereoscopic measurements accurate to a fraction of a micrometer (micron) by means of a laser interferometer measuring system. While the interferometer incorporated in the HPSC is one of the most accurate and reliable measurement systems known, thermal drift and machine variations can affect the critical measurement outputs of the comparator over an extended period of time. Therefore, the machine must be periodically checked against a known standard. There presently are scales of one micrometer accuracy that can be used for the calibration of operational comparators in NPIC, but there is no existing technique to check comparator accuracies in the submicrometer region. In addition, [] Mensuration Studies have indicated that human "pointing error" can be greater than the allowable error for the instrument being calibrated. In response to these requirements, efforts have been expended to develop a Center capability for calibration in the submicrometer area, more specifically, for a submicrometer calibration device to provide support for calibration checks of the HPSC. This requires the development of a new technology.

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3. The proposed device will operate essentially by performing an automatic scan of a calibrated scale by means of a miniaturized electro-mechanical-optical system. A null meter will tell the operator when the comparator microscope is exactly centered on the calibrated scale marking; thereby eliminating human error from the system. The goals of this development are two fold: first, to provide certified, thermally stable scales accurate to $\frac{1}{2}$ micrometer that are traceable to, and certified by, the National Bureau of Standards and second, to provide an electronically centered error detector to help remove the operator uncertainty from the calibration system. Despite the fact that this development will not be ready in time for the initial testing of the

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HPSC in late 1970, an operating prototype calibration device (based on the concepts developed under this contract) could be manufactured in mid-1971 for regularly scheduled calibration checks to insure the continued stability and reliability of the equipment.

4. A three phased, fifteen-month program has been proposed for the development of the required final prototype calibrator. However, it is recommended that only Phase I be undertaken at this time. During this eight-month phase, an Experimental Calibrator will be fabricated and tested on a GFE microscope assembly at the contractor's facilities. This will fully establish the operation and electronic nulling principles. In addition, three quality scribed scales will be calibrated and certified by NBS.

Phase II and Phase III which are planned for a later date will comprise testing the experimental device on the HPSC at NPIC, data analysis of these tests, and the design, construction, and testing of the final Prototype Calibration Device. The basic theory of this development is sound. The technical risk involved in this project is average for the development of a new technique.

5. Since this equipment is an innovation based upon a previous study and breadboard by a particular contractor, the development will be a follow-on effort and, consequently, will be handled as a sole source item.

6. Successful completion of Phase I, the fabrication and testing of the Experimental Calibrator, will be followed by Phases II and III, the actual testing of the Experimental device at NPIC, and the design, fabrication, and testing of the final required Prototype Calibrator. It is expected that the last two phases will be funded in FY-1971 at a cost of approximately []

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8. It is requested that approval be granted to negotiate an R&D contract with [] at a cost not to exceed []

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Chief, Technical Services & Support Group, NPIC

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Attachments:

1. Proposal
2. Form 2420

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APPROVED:



ARTHUR C. LUNDAHL

Director

National Photographic Interpretation Center

6 APR 1970

Date

Distribution:

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